XGenesys Development Corp.

"Developing a Renewable Future"

July 5, 2006

Massachusetts Department of Energy Resources
100 Cambridge Street
Suite 1020
Boston, MA 02114

Attention: Howard Bernstein, Ph.D.

RE: Massachusetts Renewable Portfolio Standard Rules – Public Comments

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President
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Dear Dr. Bernstein:

Introduction

XGenesys Development Corporation respectfully submits initial comments to the Massachusetts Division of Energy Resources ("DOER") to address two (2) DRAFT rules within the proposed regulations for the Renewable Energy Portfolio Standard (RPS). The three issues XGenesys outlines in this communication relate to 1) Clarification and/or a proposed amendment for the definition of eligible biomass fuel with respect to wood, and 2) The reimplementation of Advisory Rulings.

I. Clarification and/or a Proposed Amendment for the Definition of Eligible Biomass Fuel with Respect to Wood

The production of energy and biofuel related products have played an integral role in the development and implementation of Advanced Biomass Power Generation Technologies. Advanced technologies that enable the production of energy and biofuel products are currently designed to use traditional sources of biomass including wood, corn and grass. As technology progresses, so does the ability to target specific molecular structures of biomass in order to increase the yield and efficiency of energy production and

biofuel extraction. The current language of the RPS DRAFT rules defines wood biomass very broadly and given that new technologies allow for more specific targeting of structures within wood for renewable energy release and biofuel extraction, we are proposing that the language reflect current and future processes that target the specific molecular structures of biomass in order to reflect advancements in technology.

The proximate analysis of hardwood and softwood has determined that wood is composed of essentially three natural components. These components include cellulose, hemicellulose and lignin. The approximate percent composition of these components in softwood and hardwood are outlined in Figure 1.

Table 1: Proximate Analysis of Wood[1]

Species	Lignin (%)	Hemicellulose (%)	Cellulose (%)
Softwood	27.8	24	41
Hardwood	19.5	35	39

Each of these three natural components exhibit very unique characteristics of energy release when combusted. Of the three, *dry* lignin yields the most energy with a higher heating value (HHV) of approximately 10,000 to 11,000 Btu/lb. Hemicellulose and cellulose have HHV's of approximately 8000 Btu/lb.[2] The lower heating values of cellulose and hemicellulose are attributable to these components containing several molecules of water which tend to act as a heat sink.[3] It is also important to note that the combustion of solid biomass fuels occurs in stages. When solid wood biomass fuels are fed into a boiler, they are thermally degraded over a short period of time.[4] Additionally, when exposed to a strong energy source (such as a firing boiler), solid wood biomass is broken down into a mixture of gaseous volatiles, tars (tend to increase the HHV of gaseous volatiles), and carbonaceous char. Cellulose and hemicellulose mainly form the

[1] http://ecoharmony.com/thesis/AppdxD.htm: Appendix D Wood Combustion Attachment
[2] White, R.H. Effect of lignin content and extractives on the higher heating value of wood. *Wood and Fiber Science*, **19**(4), 1987, pp. 446-452.
[3] http://ecoharmony.com/thesis/AppdxD.htm: Appendix D Wood Combustion Attachment
[4] Dietenberger, Mark. Update for Combustion Properties of Wood Components. *Fire and Materials*, 2002; **26**: 255-267.

gaseous volatiles while lignin forms into solid char. These gases and char have completely different chemical mechanisms and kinetics during combustion.[5]

The properties of wood described above are important to recognize while contemplating rules for the Renewable Energy Portfolio Standard because the chemical processes used to produce cellulose based biofuels, cellulose based biofuel additives, and cellulose based ethanol specifically target only the cellulose portion of wood, leaving behind as a byproduct, a unconverted portion of hemicellulose and lignin in the form of a high heating value carbonaceous char. This char byproduct should be used as an efficient fuel in a Renewable Power Generating Facility.

The compelling advantage of using wood for the production of biofuel based products and the char for use in a power generating facility is that you are essentially generating two valuable renewable products (biofuel based products and energy) using the same initial wood feedstock. Methods for using specific components of biomass is the most efficient and sustainable way of generating multiple renewable energy and fuel sources. Given the current and future advancement in technology that is sure to increase the efficiently of biomass for energy production, XGenesys Development Corporation requests the DOER expand the definition of wood as an eligible biomass fuel in order to allow specific components of wood that may be extracted or left as a byproduct in digestive and or catalytic processes, to be used as an eligible fuel. More specifically, the definition could be expanded to *"wood, wood char, or naturally occurring components of wood that are a byproduct of a renewable energy/fuel generating process."* By adding such specific language to the rules for wood and/or other eligible biomass fuels, developers will be enabled to move more rapidly in project development and limit the number of case by case meetings and ruling that the DOER may need to formulate opinions on in the future.

[5] IBID

II. Reimplementation of Advisory Rulings

The ability to obtain funding from the financial community, including private investors, banks, and the public markets require that the risks of such a project be weighed against alternatives. The development and construction of a renewable power generation facility, biofuel facility, or a synergistic combination of these two types of facilities in a renewable campus setting, requires assurances and opinions from the DOER that such a project will qualify for Renewable Energy Credits/Certificates. The DRAFT RPS Guidelines currently define and require Advanced Biomass Technologies for the combustion of biomass. Unfortunately, the financial community is not always familiar or up to date the current advancements in technology and have traditionally relied upon government agencies to limit investment risk. This unfamiliarity of state-of-the-art technology requires assurances from the DOER that such a technology is exactly what the Renewable Energy Portfolio Standard is trying to cultivate. The backing or an advisory ruling by DOER on a particular project, especially one that may need to be evaluated on a case by case basis by multiple departments of DOER and DEP, will provide tremendous guidance for both developers and the financial community in evaluating the financial risk of such projects.

Sincerely,

/"William Dell'Orfano"/

William Dell'Orfano
President
XGenesys Development Corp

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